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READING IN THE CLASS ROOM

TEACHING DIAGNOSTIC AND CORRECTIVE TECHNIQUES

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"READING" IN THE CLASS ROOM

Teaching, Diagnostic, and Corrective Techniques

with the

Ophthalm-O-Graph

A Portable, Binocular Eye-Movement Camera

and the

Metron-O-Scope

A Triple Shutter, Short-Exposure Device for the Practice of Controlled Reading

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The 1937 Yearbook of the National Society for the Study of Education is devoted to reading.

Many schools are carrying on preventive programs for the development of efficient readers, as well as corrective work with those who have not acquired effective reading habits, attitudes and skills.

The trend is toward a curriculum in which the activity of the pupil furnishes a motive for reading, compels reading over a wide range of subjects, and provides a situation in which the knowledge gained from reading is utilized constantly. The development of skilled readers, then, is more essential in the modern school than in the classroom where traditional methods of instruction prevailed.

PREPARE YOUR SCHOOL TO PARTICIPATE IN THE NATION-WIDE READING PROGRAM.

American Optical Company

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I. READING IN CONTEMPORARY LIFE

Educational theories and practices follow closely the trend of public thought. The curriculum in the public schools of the United States has expanded to meet the needs of a democracy living under a highly developed social, economic and political system.

In this new curriculum reading occupies a place of major importance. Recent changes that have occurred and some of the problems that have arisen in this field merit attention.

In the Elementary Grades

Until recently, the elementary school emphasized instruction and drill in the mechanical habits associated with *oral* reading. The shift in practice to rapid, silent reading over a wide range of subjects was not noticeable until the 1920's. The present trend is toward the retention of formal instruction and drill in basic reading habits in the elementary school. The educator, however, does not think of reading as a "subject," but as a highly specialized set of skills to be used in every type of school activity. The modern elementary curriculum furnishes a motive for reading, compels reading over a wide range of subjects, and provides a situation in which the knowledge gained from reading is utilized constantly.

The average pupil in the schools today is required to read approximately fifteen times as much as a pupil at the same level of instruction read in 1900. The need for the development of greater skill in reading is keenly felt.

In the High School

In the past, a pupil's training in the fundamental reading skills has been arbitrarily stopped in the elementary grades without particular regard to individual needs. Today, it is recognized that a large percentage of any high school enrollment is still struggling with lower level techniques in reading. Further, the modern educator realizes that until these rudimentary techniques have been thoroughly mastered, the acquisition of advanced skills will be difficult.

Definite steps are being taken in many high schools to thoroughly understand the deficiencies present, and apply corrective measures. Surveys have produced an abundance of valuable data which are rapidly becoming available to all schools. Question: "Why do high school students today

seem to be handicapped in reading to a greater extent than students a few years ago? At least a portion of the answer can be found in the fact that the 1937 student has been assigned a reading load reaching into the millions of words, whereas the student at the same level a few years ago was required to read only one-fifth as much.

In the College

The yearly number of college graduates since 1920 has increased 183.5%.[1] No figures are available concerning the increase in the number of college failures due to reading disability. Experimental data indicate, however, that even in terms of mechanical efficiency, a large percentage of college students have not attained the college reading norms. This means that the colleges must determine the reading difficulties of their students through surveys, and provide an adequate foundation in reading for many of them before formal instruction will produce best results. The modern college student, having his reading load multiplied by five, now needs assistance.

The Reading Load of the Adult

Escape from the portals of formal education does not mean escape from the tremendous reading load of 1937.

The volume of the general publications read by the average adult has increased 170% since 1900. Rapid communication by means of the automobile, the airplane, and the radio, and the abundance of popular, inexpensive literature, has brought the average citizen into contact with the whole world. It is the consensus of opinion that the ability to read effectively contributes to the success and happiness of the individual.

Readers of all ages are adding daily to their store of cultural and professional knowledge, and in ever-increasing numbers are turning to the printed page for amusement, excitement, adventure—in short, for escape from the monotony of daily life.

Place of Reading in Industry

Efficient reading is important in the business and industrial world. The introduction of the typewriter, and other machines designed to facilitate office work, has resulted in an enormous increase in the amount of near point work.

1. "March of Education," News Letter No. 11, November, 1936. Office of Education, Washington, D. C.

In many lines of work an office correspondent must read 500% more than was required in the same position in 1900.

Needless to say, these rigid reading requirements are depriving the visually inefficient of many educational and economic opportunities. Every individual, of course, has the ability to compensate, in some degree, for a physiological difficulty, but until the underlying cause is removed, the functional capacity of the organism is limited by it. The eye-movement photographs of over 3,000 subjects of all ages, taken at random from various sections of the country, revealed that not more than 25% of them were reading with real efficiency. It would seem that the American people are not equipped, on the whole, for the reading load imposed on them by the educational, social, economic and political system which they have developed.

An Important Requirement in Efficient Reading

In the new concept of reading the efficient reader must be able not only *to recognize instantly the printed symbols and comprehend their meaning*, but to *interpret and apply* the information so gained. It is recognized, also, that listening and reading are essentially the same process. The stimulus differs, but the reaction is the same. The reading teacher, then, is developing not only the ability to gain ideas from the printed page, but to react intelligently to the radio and the motion picture. She is primarily responsible for the establishment of the habits and skills underlying this highly specialized activity. Attention is called to the fact, however, that the first step in efficient reading is *instantaneous recognition of the printed symbol*, and the teacher's efforts are futile if the pupil is prevented, by visual inefficiencies, from responding to educational techniques.

Scientific data show that some of the most common types of reading disability are related directly to visual inefficiencies that can be corrected. The educator is realizing more and more that many of the "problem" cases in the reading class are in need of lenses, or some type of corrective training. He is looking to the eye specialist, therefore to cooperate in a vigorous program that will reduce the number of failing and retarded students by taking care of visual inefficiencies associated with reading disability.

This situation is a challenge to the educator as well as the eye specialist.

Fig. 1. The Ophthalm-O-Graph. *Patent Pending.*

The Teacher Needs Help

Appalling numbers of pupils from the primary grades, high schools, colleges, and adults in the industrial world are in need of immediate assistance toward more efficient reading. Naturally everyone looks to the thousands of members of the teaching profession to render this help. However, let us consider some facts in the case: Since 1920 public school enrollment has increased 164.9%. The teaching force to handle these some seven millions of students has been increased just 28.8%[1]. Teachers are thus faced with a most important responsibility (helping millions to better reading) in the face of a discouraging handicap. The solution lies in placing at the disposal of the teacher and the school the best of everything produced in the way of scientific aids to conserve time and insure maximum results.

II. THE OPHTHALM-O-GRAPH — A DIAGNOSTIC INSTRUMENT.

The Ophthalm-O-Graph is a *portable*, *binocular* eye-movement camera. Eye-movement photography as a laboratory technique is not new, having been used continuously in various lines of research in American universities since 1899. During that year Dr. Raymond Dodge completed the first eye-movement camera at Wesleyan University, Middletown, Connecticut. In the past, however, the experimental equipment has been too cumbersome and too expensive (the actual cost sometimes being as high as $4,000), to make it available for universal use.

Operation of the Ophthalm-O-Graph

The mechanism of the Ophthalm-O-Graph is simple. With a little practice, anyone can become proficient in its use. Photography is carried on in a lighted room and from fifteen to twenty-five subjects may be photographed within an hour.

From 50 to 75 reading-graphs can be recorded on a 100-foot roll (35 mm. daylight loading motion picture film), depending on the length of the reading selection. The exposed film is removed from the camera without disturbing the unused portion of the roll. Development is a simple process, which

1. "March of Education," News Letter No. 11, November, 1936. Office of Education, Washington, D. C.

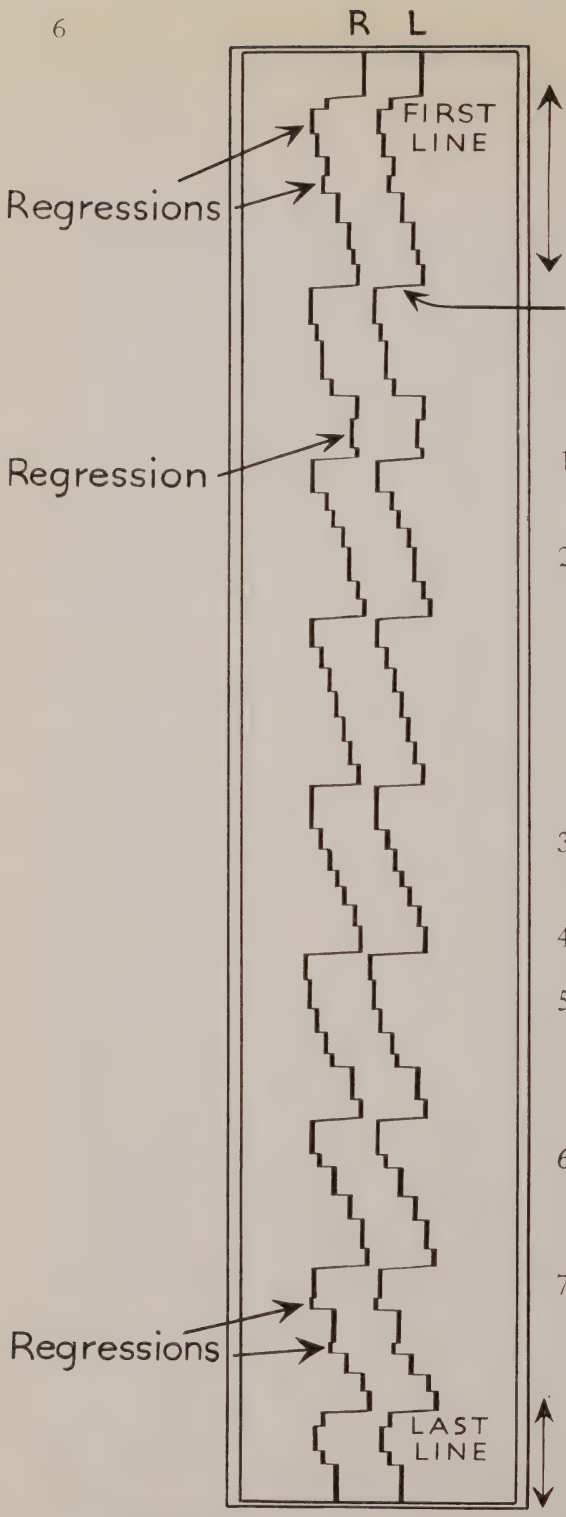


Fig. 2. INTERPRETATION OF THE READING-GRAPH.

1. Look for over-stepping of the ultimate position of fixation.
2. Look for lack of binocular coordination and lateral control, in the absence of parallelism.
   (a) at the beginning of each fixation,
   (b) in inter - fixation movements, and
   (c) in the return sweeps.
3. Count the number of fixations (including regressions).
4. Count the number of regressions.
5. Compute the reaction time by finding the average duration of fixation in fractions of a second.
6. Compute the span of recognition by averaging the number of words per fixation.
7. Compute the reading rate, or speed, by comparing the length of the graph (exclusive of the first and last lines) with the Table of Speeds in the Manual.

NOTE: The graph of either eye may be used in counting the fixations and regressions, but the clearer line is generally selected for this purpose.
The first and last lines of a short reading selection are not characteristic of the reading performance. The text on the standard camera card has been arranged, therefore, so that the subject reads 25 or 50 words exclusive of the first and last line. To obtain data in terms of 100 words, multiply by 4 or 2, as the case may be.

can be mastered by following the directions,[1] or any photographer will do this work for a nominal charge. A reading-graph costs five to fifteen cents. The Ophthalm-O-Graph is *portable*, *easy to operate*, and *inexpensive*—both in initial cost and operation.

III. EYE-MOVEMENT PHOTOGRAPHY WITH THE OPHTHALM-O-GRAPH

The Corneal Reflection Method

The corneal reflection method is used in photographing eye-movements with the Ophthalm-O-Graph. Small lights focused on the eyes are reflected by the corneas, and these reflections, magnified more than four times, appear as tiny beads of light in the camera reflex finder. The movement of the light beads corresponds with the movement of the eyes.

Fixations

As the film moves vertically through the camera, and the reader's eyes move horizontally across the page from left to right, the eye fixations, or eye pauses, along the line of print are recorded as vertical marks, forming the double "stairway" in Fig. 2. The left line is the record made by the right eye, and the right line is that made by the left eye.

Since the film travels at a constant speed, the length of the "step" represents the duration of the corresponding fixation. The number of steps in a stairway represents the number of fixations in the line of print. The amount of print recognized in a single fixation is known as the "span of recognition."[2] An eye-movement photograph furnishes the only accurate measure of the span of recognition.

Regressions and the Return Sweep

Regressions, or backward movements within the stairway, are in many cases merely corrective adjustments due to inaccuracies of perception. At the end of each stairway there is a thin, horizontal line made by the "return sweep" of the eyes as they move from the end of one line of print to the beginning of the next.

1. The Manuals which accompany the instruments, contain detailed descriptions and directions for their operation and care. Copy will be furnished by American Optical Company on request.
2. Cf. p. 19.

Reading Rate or Speed

The film used in the Ophthalm-O-Graph moves through the camera at a constant speed of ½ inch per second. The total reading time for a given number of words can be computed quickly by measuring the reading-graph with a ruler. The reading rate is computed by comparing the reading time with the Table of Speeds.[1]

Testing Reading Efficiency

While his eye-movements are being photographed, the subject reads standardized material from a card attached to the Ophthalm-O-Graph. Comprehension is checked in the usual way, by questions based on the reading material. The objective data secured from the reading-graph, and the results of the comprehension test, supply evidence of the functional efficiency of the individual in reacting to the printed symbol.

IV. THE BINOCULAR READING-GRAPH — A DIAGNOSTIC AND PROGNOSTIC DEVICE

The binocular reading-graph is indispensable in a thorough diagnosis of reading disability.

Just as the X-ray permits the dentist to study defects in his patients' teeth, so the binocular reading-graph, or eye-movement photograph secured in the act of reading, permits the study of the ocular activities which take place during the reading process. It is secured under normal reading conditions: the movements of both eyes are recorded simultaneously on the same film, and the eye-movements of subjects wearing any type of lenses can be photographed successfully.

Efficient and Inefficient Readers

The reading-graphs on the following pages are typical of readers found in every community.

1. Printed in Manual for Controlled Reading (in the classroom or reading clinic) and Manual for Office Practice. American Optical Company, Southbridge, Mass., 1937.

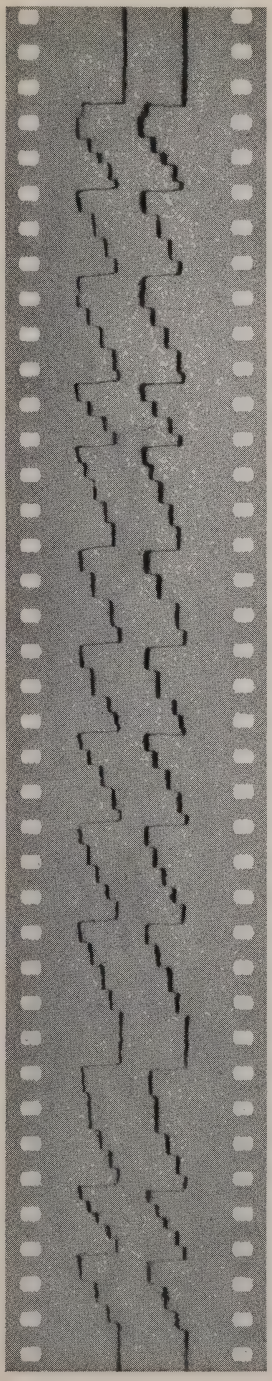


Fig. 3. Reading-graph of a high school girl who is an efficient reader, although she received no special training. The data secured from over 3,000 reading-graphs indicate that only about 25% of those tested had acquired, without special training, the rhythmical, coordinated eye habits revealed in this graph.

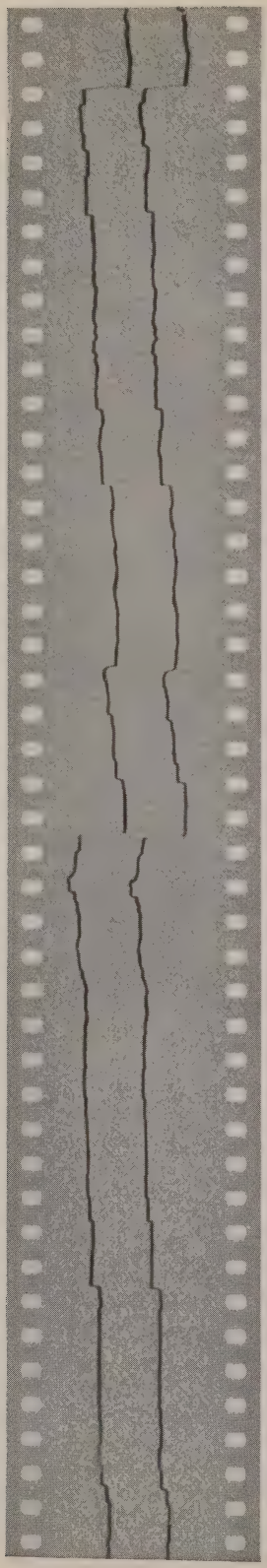


Fig. 4. Reading-graph of a boy in the fifth grade, who has failed three times in covering five years of school work. He has little trouble, however, in comprehending and retaining subject matter if he hears it discussed.

The graph furnishes some very interesting data:

1. A very narrow span of recognition is indicated by the excessive number of fixations.

2. Lack of motility is shown in the sluggish movement, which resulted in a long stairway for each line.

3. Approximately 300 fixations and 125 regressions per 100 words. The fifth grade norm is 125 fixations and 25 regressions.

4. Speed about 20 words per minute. Fifth grade norm is 190 words per minute.

In terms of fixations, regressions and reading rate, this is below the norm for a first-grade pupil who has had one term of reading instruction.

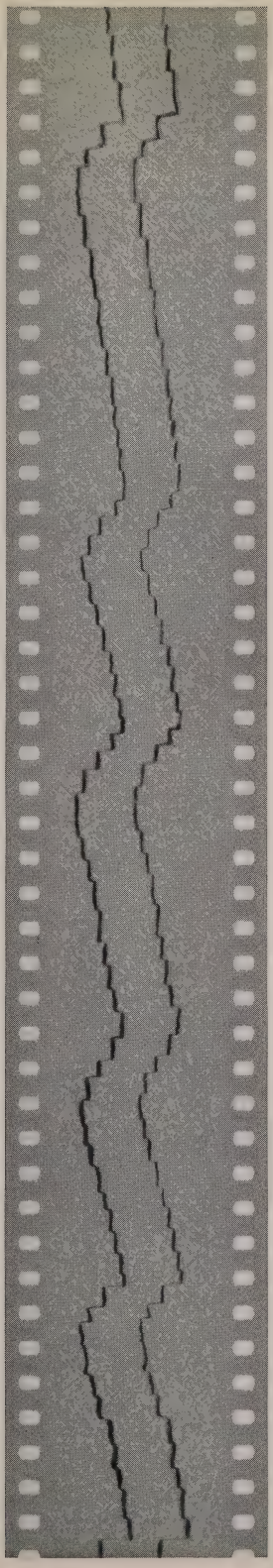


Fig. 5. Reading-graph of a man 37 years old, who is an inefficient reader.

He has low visual acuity, but the eyes work together in binocular coordination fairly well, as indicated by the parallelism of the lines.

The "reverse" stairways are explained by the fact that this subject, because of poor vision, is afraid he will lose the place on the page during the return sweep. In order to find the beginning of a new line, he feels his way back along the line just read, then drops down to the new line. This is characteristic also of a type of reading found in the lower grades, among children who have not learned to control their eyes in the lateral sweep.

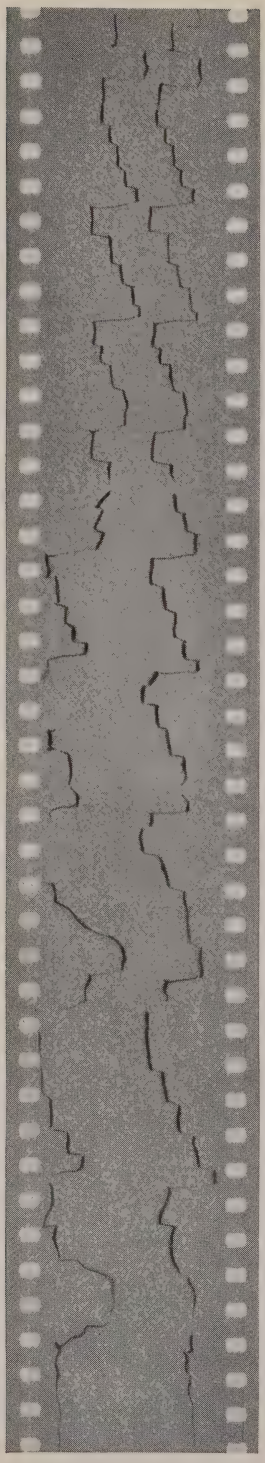


Fig. 6. Reading-graph of a high school girl, who has difficulty in fusing the retinal images. Fusion takes place at infinity, or when she is looking into the stereoscope, but in reading at the near point she cannot maintain binocular fixation for any length of time.

The reading-graph shows that the two eyes worked together while she read the first three lines of print. Diplopia then occurred, the right eye deviating nasalward. This was probably a compensatory reaction to avoid a fusional conflict. The subject was able to restore binocular fixation by setting the eyes for distance vision, but after a few minutes of reading, diplopia recurred.

Fig. 7. Reading-graph of a high school boy, hyper-exophoria type. It is apparent that when he attempts to read one eye tends to move horizontally and the other vertically.

This student is seriously handicapped in mathematics and other subjects requiring many, minute, precise fixations. It is obvious that for him reading of any type is a laborious task. He has repeated a number of courses more than once in order to acquire the subject matter.

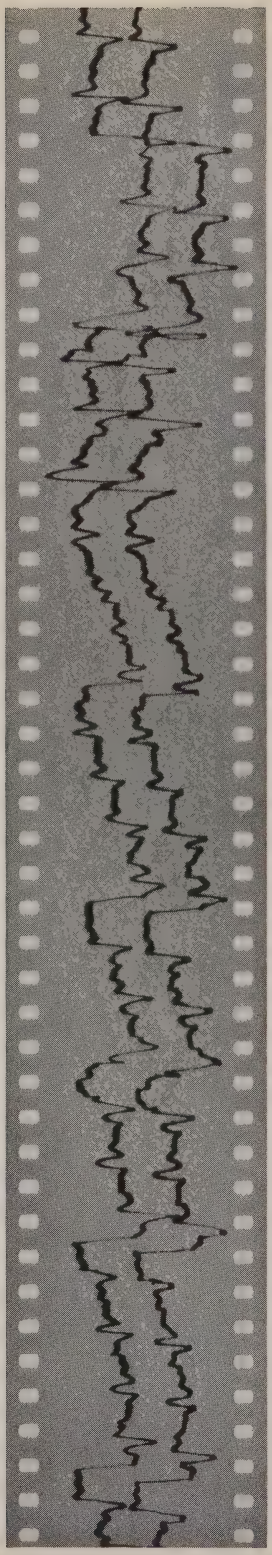


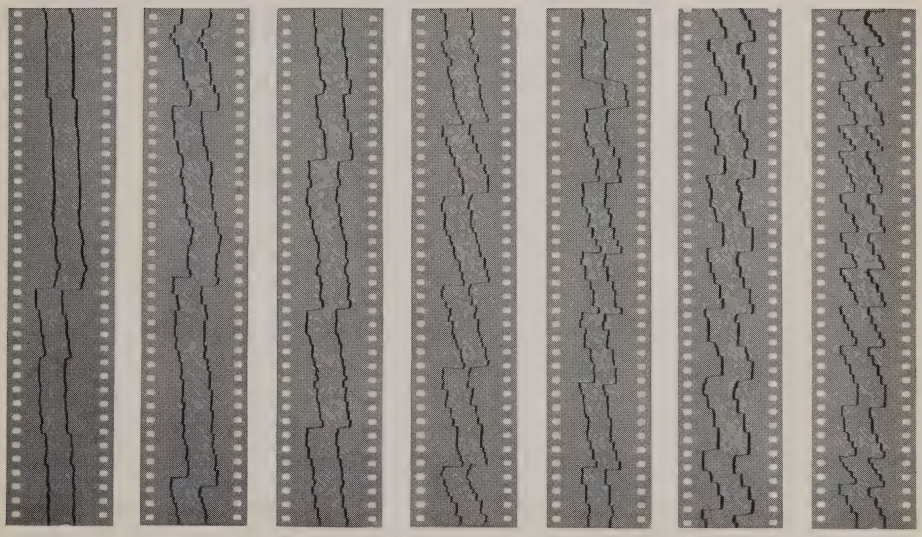
Fig. 8. Reading-graph of a subject with nystagmus.

The graph shows that there is little progressive left-to-right movement, but instead a series of lateral sweeps.

MATURATION OF THE READING HABIT

In the modern school, reading maturity is a significant factor in placement and promotion at all levels of elementary instruction. "Reading readiness" is characterized by certain definite mechanical habits and skills.

Scientific data show that the reading-graph is the *only reading test* that furnishes *objective* information concerning the maturity of reading habits.



Grade 1 *Grade 2* *Grade 3* *Grade 4* *Grade 6* *High School* *College*

Fig. 9.

The change in the eye habit of the average pupil, as he advances academically, is characterized by—

a. a more rhythmical pattern,

b. fewer fixations to the line, indicating a broadening of the span of recognition, and

c shorter fixations, indicating more rapid reaction to the printed symbol.

NORMS AND AVERAGES

The eye-movement norms in the table on page 17 are based on scientific data comparable with that secured by eye-movement photography with the Ophthalm-O-Graph. The scores in the second line of each item represent data taken from the reading-graphs of a number of subjects trained with the Metron-O-Scope, and indicate the type of performance to be expected at the respective grade levels.

A comparison of the data from a reading graph with the table furnishes the teacher tangible, concrete information concerning the functional efficiency of the reader. For the first time she can determine just how effective the eye habits are when a pupil is reading. This objective data very often will suggest the type of corrective procedure which will prove beneficial for cases of reading disability. In grouping students for instructional purposes the reading graph and the table of norms have a very definite place in the classroom.

EYE MOVEMENT NORMS

Based on silent reading of standard material for the various grade levels

Grades	High I	Second	Third	Fourth	Fifth	Sixth	Seventh	High School	College
Average number of fixations per 100 words.	250	200	175	140	125	120	115	93	80
Averages obtained by Metron-O-Scopic training.	190	150	137	115	100	98	95	88	70
Average number of regressions per 100 words.	60	50	40	30	25	23	21	17	10
Averages obtained by Metron-O-Scopic training.	40	32	30	25	20	16	15	13	8
Average Reading rate, words per minute.	55	90	115	168	190	200	210	295	325
Averages obtained by Metron-O-Scopic training.	90	130	160	198	225	250	280	350	425

To use the table: Compute data of film record and compare the number of fixations and regressions and speed with the appropriate grade level. For instance, using the first line of figures in each item—if the subject's reading-rate is 200 words per minute he is at sixth grade level in terms of speed. If he makes 110 fixations in reading 100 words he is better than seventh grade in terms of fixations; and if he makes 17 regressions in reading 100 words he is average for high school level. The second line of figures in each item provides comparable data taken from the reading-graphs of subjects who had received Metron-O-Scopic training.

V. THE OPHTHALM-O-GRAPH AS A SURVEY INSTRUMENT.

The General School Survey

In the modern school survey the Ophthalm-O-Graph is invaluable. The binocular reading-graph secured with it furnishes details of highest diagnostic value concerning reading ability.

The information obtained from the binocular reading-graph supplements all other types of reading tests. *By means of this objective test the teacher can actually see how the child attacks the printed page.* With it the teacher is in a better position to classify her pupils on the basis of reading ability, and to determine whether the individual

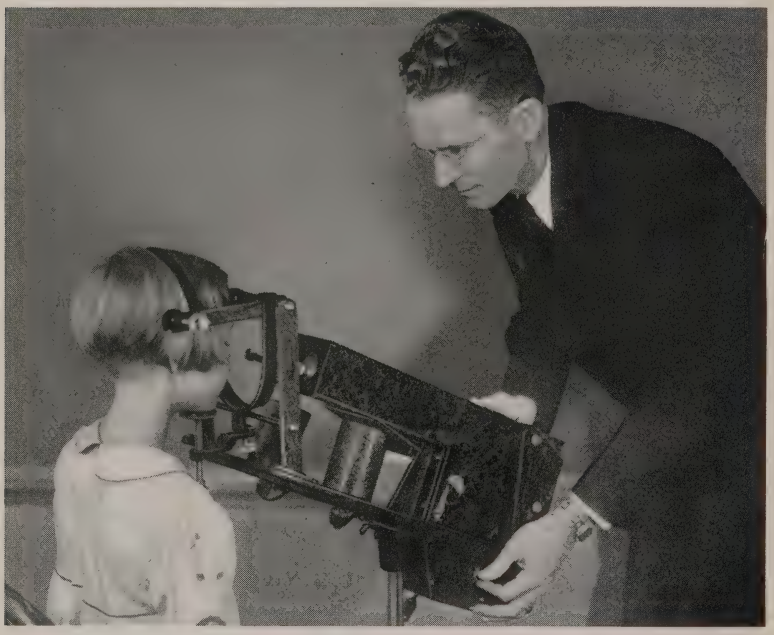


Fig. 10. Photographing the Eye-Movements of a Second Grade Pupil with the Ophthalm-O-Graph

student is prepared to carry the reading load imposed by the school curriculum.

The reading-graph, or eye-movement photograph secured in the act of reading, is the only *objective* test of binocular coordination and the maturity of reading habits.

It permits sharp differentiation between those students who (1) are prepared to carry the reading load imposed by the curriculum, and (2) those who need corrective methods of instruction.

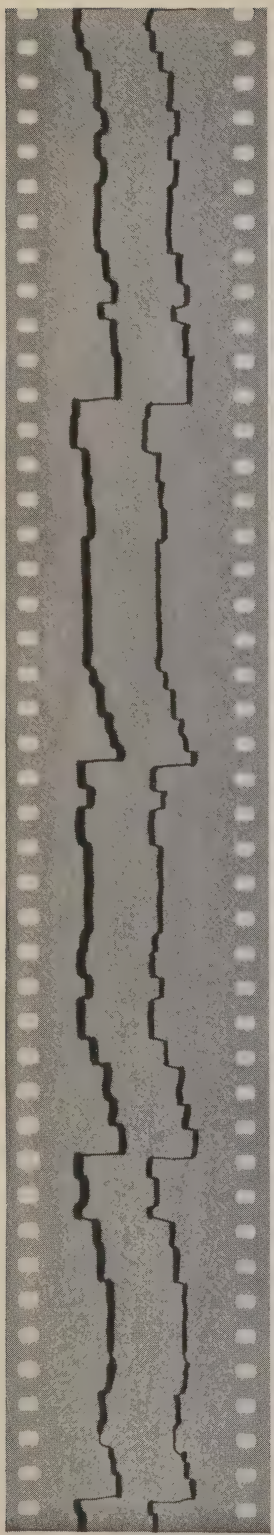
With the data secured from a reading-graph the educator has a more intelligent basis for decisions affecting the placing, grouping, and promotion of students. It is an effective device in (1) locating those first grade pupils who have not been able to acquire an effective eye habit during the first term of reading instruction, (2) grouping pupils for remedial work within the appropriate grade level, and (3) securing in advance, information that will indicate whether the high school student or the college freshman is equipped to carry the reading load in the content fields.

The objective data secured from the reading-graph are valuable also in suggesting the type of remedial training that should be most beneficial in the individual case. It enables the educator to predict, with some degree of certainty, the performance of the student in any reading situation.

College Freshman Survey

The college which includes eye-movement photography in its survey of incoming freshmen *can obtain in advance* objective information as to the maturity of their reading habits. The data will not only indicate the students who are equipped, from the standpoint of reading efficiency, to carry the college load, but will also suggest the type of remedial procedure which should be followed in individual cases of reading disability.

By repeating the survey at the beginning of each academic year the results of any corrective procedures may be measured and correlated with the scholastic attainments of the students.



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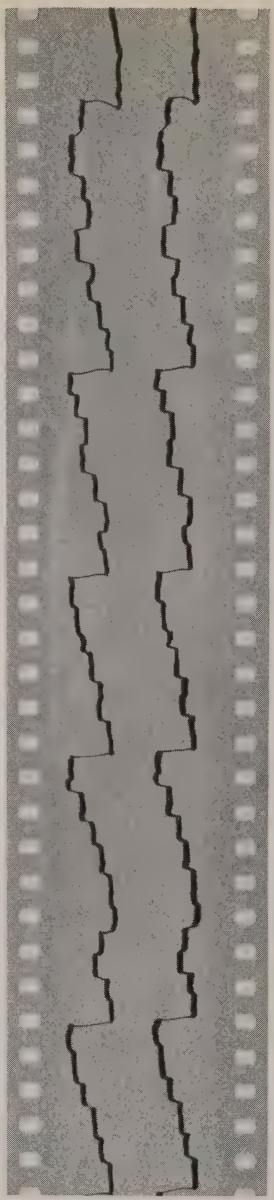

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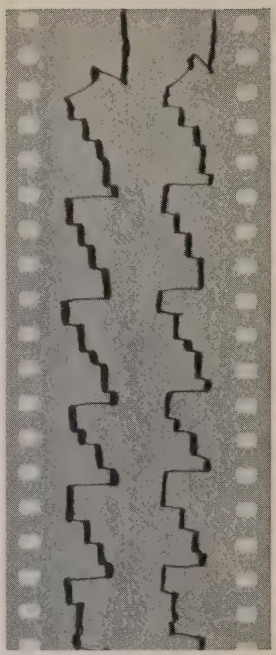


III

The reading-graphs of three freshmen who entered college at the same time, showing the range of reading ability in a group of over 600 high school graduates.

I. Reading habits of an average pupil entering grade 4.

II. Average for a high school graduate in terms of fixations and regressions, but slow in reaction time. Lacks lateral control of the eyes and binocular coordination.

III. Far above the college norm; efficient eye habit, rhythmical, well-coordinated eye movements.

Data from graphs	1	2	3
Fixations per 100 words	110	78	42
Regressions per 100 words	30	14	2
Average duration of fix. (in fractions of second) .	.360	.262	.238
Span of recognition (no. of words per fixation) .	.909	1.282	2.381
Reading rate (no. of words per minute) . . .	152	290	585
Comprehension score %	70	50	80

Fig. 11.

Patented and Patent Pending Fig. 12

THE METRON-O-SCOPE

The Senior model, used in group training and in the classroom. The Junior model, which is used for individual case work, is illustrated on page 38.

VI. THE METRON-O-SCOPE — A DEVICE FOR CONTROLLED READING.

The Metron-O-Scope is a triple shutter, short exposure device, for controlled reading. It is the first mechanical device to adequately control the reading situation. The triple shutter feature compels reading in a rhythmical left-to-right sequence, and conditions an accurate return sweep. The reaction time is controlled by limiting the length of the exposure time, and, as the material cannot be reread, regressive movements within the line are discouraged.

The speed of the reading also is automatically controlled, and can be increased gradually without affecting the rhythm and accuracy.

In actual practice, the operator has only to insert the roll in the instrument, adjust the speed dial to the desired point (the range is from 15 to 50 lines per minute), and turn the switch. Immediately the attention of the reader is centered on the instrument and controlled reading begins.

The Span of Recognition

It is a well known fact that the eyes while reading do not move in a continuous sweep but follow the line of print in a series of jumps or jerks. Reading takes place while the eyes pause, or fixate between these jumps.

The amount of print recognized in a single fixation is known as the "Span of recognition." Eye movement photography is the only accurate method for measuring the span of recognition. The span of recognition probably is determined by the functional efficiency of the macular area, the coordination of the eyes in the lateral sweep, the type of reading material and the vocabulary and general background of the reader.

It is recognized that every individual has a "physiological limit" beyond which the span of recognition cannot be increased but it has been demonstrated that, in the majority of cases, training in controlled reading increases the span of recognition within this limit.

If the eyes make 10 fixations in reading a line of 8 words, the average span of recognition is .8 of a word. Experimental data show that the average efficient reader at the college level

has a span of 1.2 words in reading non-technical material. Statements are made frequently that the average span of recognition is from 4 to 8 words. These statements, however, are not supported by photographic evidence. The reading-graphs of over 3,000 subjects reveal only one case with a span of 6 to 8 words, and this was not the result of training. Within the physiological limit imposed by the functional capacity of the macular area, however, the span of recognition can be increased by training.

Short-Exposure and Methods of Controlling Eye-Movements

Cattell, who introduced the short-exposure technique into this country in 1885-1886, used it for studying the reaction time and the span of recognition. He carried on the first experimental work directly related to reading. Cattell found that there is a natural tendency to perceive words and phrases as wholes rather than in their component parts.

Educators and psychologists have continued to use the short-exposure technique in reading research, and attempts have been made by classroom teachers to adapt the principle to reading instruction by using various types of flash-card exercises.

As a result of the research and experimentation along this line, teachers have attempted also to control the movements of the eyes in reading. Some of the best known classroom practices are:

1. Holding a ruler under the line.
2. Using a pointer to direct the eyes.
3. Slipping a slotted card along the line of print to expose it in sections.
4. Grouping words in thought units and spacing these units.
5. Indicating eye stops by dots under the words.
6. Pressure reading.
7. Tapping and metronomic exercises.

The fundamental idea in every instance is to condition rhythmical left-to-right eye-movements, with few fixations and regressions, and with accurate return sweeps.

Controlled Reading

In controlled reading, as practiced with the Metron-O-Scope, the eye-movements are controlled and directed while the span of recognition is being broadened.

The underlying ideas of all classroom methods designed to condition effective control of the eyes as well as the methods of short exposure to broaden the span of recognition are thus carried out in one instrument—The METRON-O-SCOPE.

It is not implied, however, that training with the triple shutter control of the Metron-O-Scope will cause all students to read with only three fixations to the line of ordinary book print. This is physiologically impossible in the majority of cases. Only three fixations to the line would entail a recognition span of about 3.5 words, and would result in a reading rate of approximately 900 words per minute. The training, however, is designed to constantly discourage excessive fixations and regressions. If a pupil habitually requires 10 fixations to a line, practice with the Metron-O-Scope may easily help him reduce them to one half this number. In practically every case trained with the Metron-O-Scope there has been a widening of the span of recognition and a proportionate increase in the reading rate.

First Grade Readers

Effective eye habits are acquired by some children during the pre-reading and initial reading period of instruction without special effort on the part of the child or the teacher, but a large percentage of first grade entrants cannot make the necessary adjustments without definite training. Experimental data show that coordinated eye activity is a learned reaction and that it can be conditioned by controlled reading as practiced with the Metron-O-Scope.

Data secured from the reading-graphs of three groups of pupils who had completed the first grade indicate that those who were trained with the Metron-O-Scope required approximately 33% fewer fixations per 100 words than those trained by traditional methods. The group trained with the Metron-O-Scope also made fewer regressions, and the comprehension scores, on standardized material, were higher.

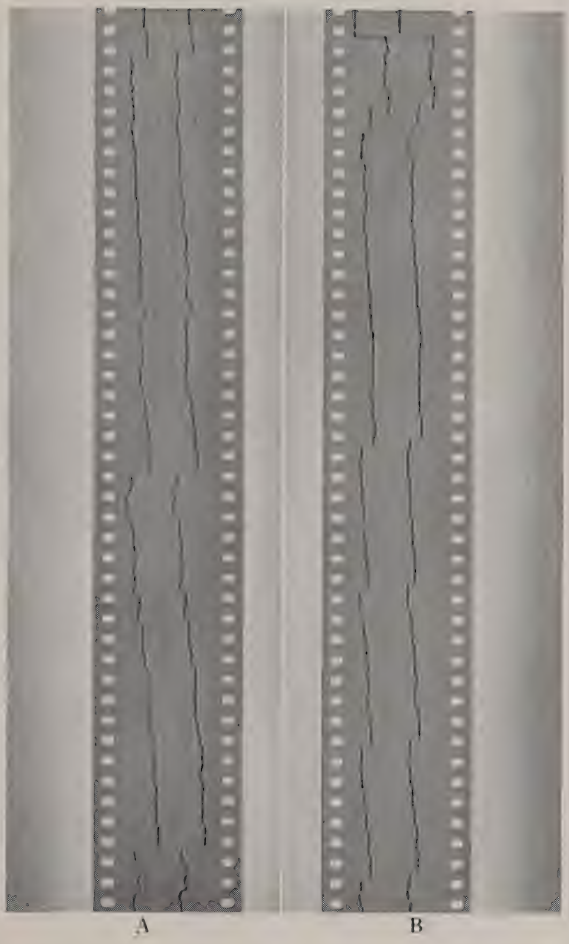


Fig. 13. Reading-graphs of two pupils who completed the work of the first grade in the spring, 1936. A received reading instruction by traditional methods. B received reading instruction with the Metron-O-Scope.

In both cases the span of recognition (indicated by number of fixations in the line) is narrow, and the reaction time (shown in duration of the fixations) is slow; but a comparison of the two graphs reveals that B has a definite eye habit which was not acquired by A.

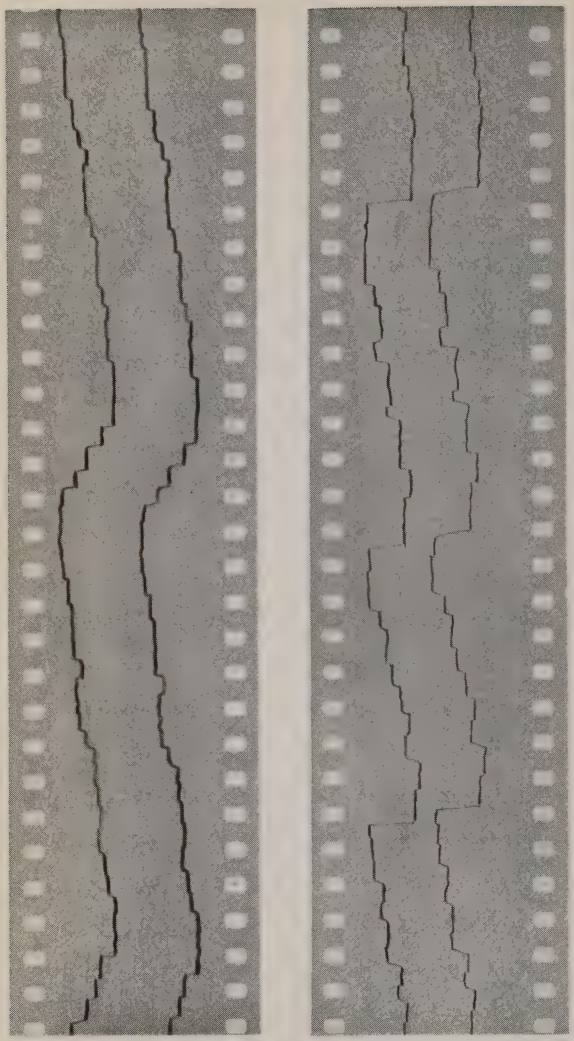


Fig. 14. Reading-graphs of a second grade boy who received group training in controlled reading with the Metron-O-Scope, in the daily classroom period during the school year.

The graph taken in September (left) shows that lateral control was poor, the reverse stairways indicating that the reader retraced the line and dropped down to the beginning of the new line. In the graph on the right, which shows the results of training, the fixations are more precise, and the return sweeps are well defined.

	Before training		After training	
Data from Reading-graphs	Data on pupil	Group average	Data on pupil	Group average
Fixations per 100 words	184	191.9	140	145.0
Regressions per 100 words	40	50.8	22	31.2
Reading rate — words per minute	81	88.1	132	137.5
Comprehension %	75	67.3	100	80.7

Data on group	Dec.	May
Number of pupils in group—26		
Aver. chronological age	8 — 1.9	8 — 6.9
Aver. reading age . . . . . (Haggerty Group Test)	7 — 10	9 — 2

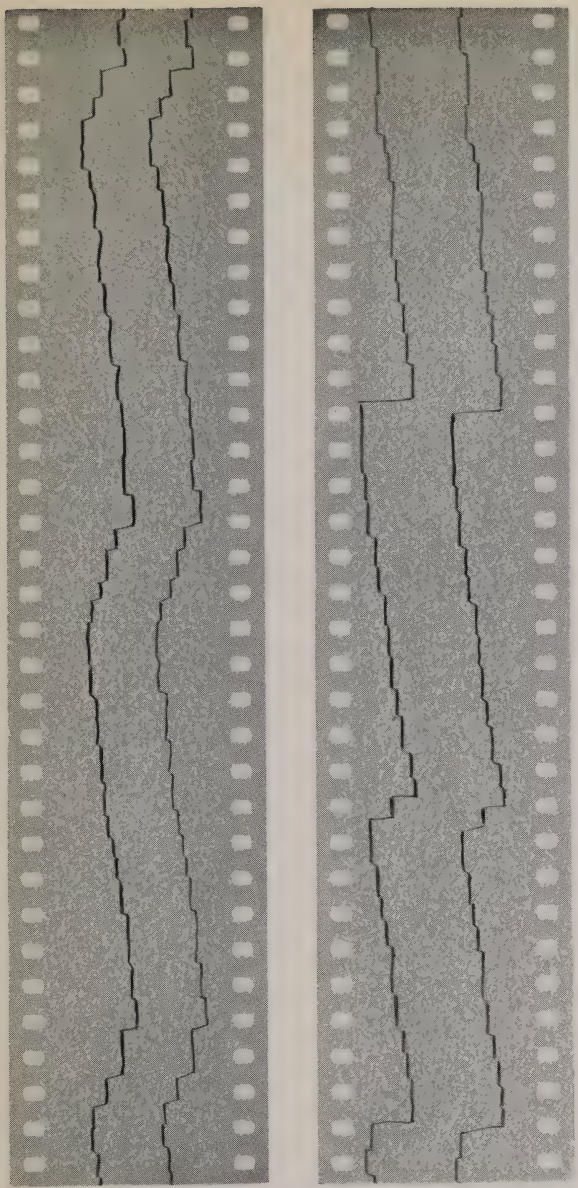


Fig. 15. Reading-graphs of a third grade boy, who received group training in controlled reading with the Metron-O-Scope, in the daily classroom period during the school year.

A comparison of the graphs shows that there was a decided improvement in the eye habit as a result of the training. The reverse stairways have been replaced, in most instances, by well defined return sweeps.

	Before training		After training	
Data from Reading-graphs	Data on pupil	Group average	Data on pupil	Group average
Fixations per 100 words	182	171.6	130	133.5
Regressions per 100 words	52	40.6	38	28.6
Reading rate — words per minute	88	115.2	171	157.4
Comprehension %	75	76.6	100	79.2

Data on Group	Dec.	May
No. of pupils in group—30		
Aver. chronological age	9 — 5.3	9 — 10.3
Actual grade in school (aver.)	3.42	3.92
New Standard Reading Test—		
Aver. reading age	9 — 9	10 — 7
Aver. reading grade	3.92	4.6

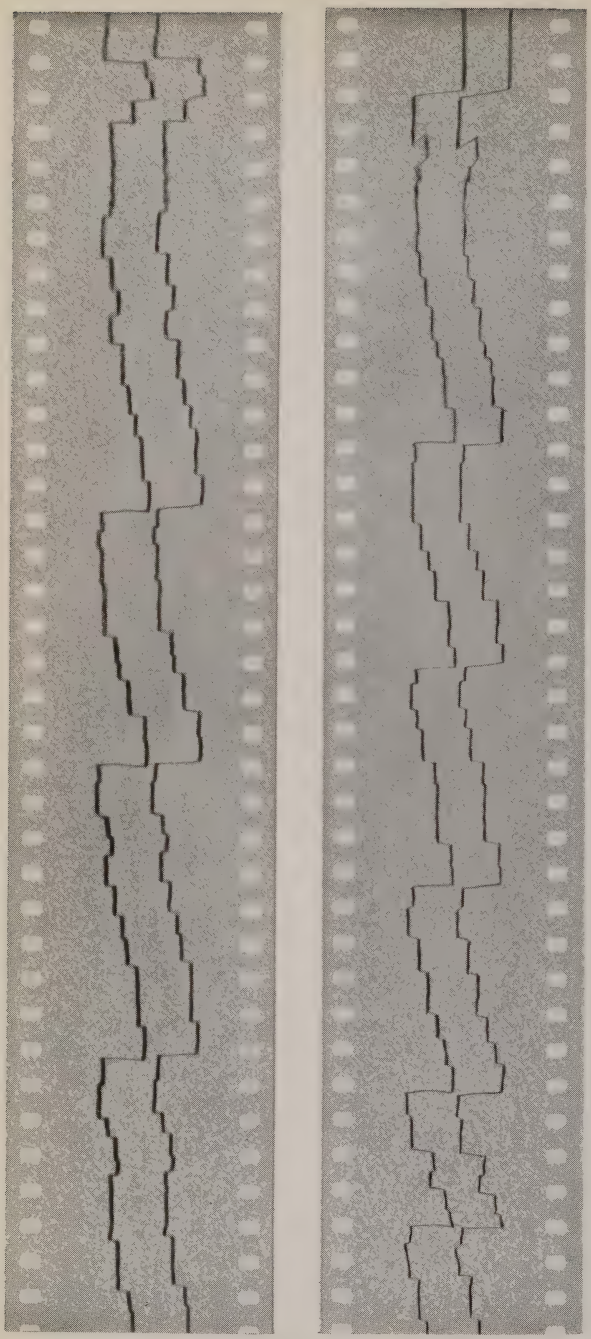


Fig. 16. Reading-graphs of a fourth grade boy, who received group training in controlled reading with the Metron-O-Scope, for two weeks.

A comparison of the graphs shows that the training resulted in a broadening of the span of recognition indicated by decrease in the number of fixations, and more rapid reaction indicated in shorter fixations.

The improvement in the eye habit without a corresponding improvement in comprehension, in reading the same type of material, would justify the conclusion that in this case the pupil would benefit by a short period of intensive training to develop interpretative ability.

Data from the Reading-graphs	Before training	After training	Comparison with Norms
Fixations per 100 words . .	105	96	High School Norm 93
Regressions per 100 words .	23	14	High School Norm 17
Reading rate — words per minute	171	230	7th Grade Norm 210
Comprehension % . . .	50	50	

VII. THE METRON-O-SCOPE IN THE CLASSROOM AND THE READING CLINIC.

The Metron-O-Scope has been used successfully in teaching and corrective techniques at all levels of instruction from the primary grades to the college. Adults up to sixty-five years of age also have been trained with success.

Fig. 17 Controlled Reading in the first grade, using a story roll.

Modern Instrumentation in the Elementary School

The teachers in the elementary schools in Bastrop, Texas, are enthusiastic about the use of the Metron-O-Scope as a teaching device. A schedule was worked out which permitted the daily use of the instrument in each of the six grades. The proportion of time devoted to silent and oral reading, the time allotted to reading from the Metron-O-Scope, and the use of the instrument daily or at less frequent intervals were left to the option of the classroom teacher.

Superintendent P. J. Dodson found this program a practical one for both teaching and corrective work. Writing about it he says:

"Some particularly noticeable advantages are mentioned in the following comments from my teachers who are using the Metron-O-Scope:

"No device has ever been introduced into our classrooms that has created so much interest among the pupils, and has produced such undivided attention. It is fascinating to see an entire room so intent upon what the next window will reveal, that each student is almost holding his breath in anticipation."

"As the teacher is free to move about the room while the instrument is in operation, and the pupil is reading with his head erect, it is easy to detect incorrect body posture and lip movements."

"The primary pupils recognize phonograms much more rapidly from the Metron-O-Scope than from flash cards or the printed page."

"By closing two windows, effective flash card exercises may be carried on with the other window. This method of drill is more effective than any previously used."

"Word study at the beginning of each roll furnishes a valuable method for increasing the child's vocabulary."

"Questions related to the reading follow on each roll, and provide an adequate comprehension test without further effort on the part of the teacher."

"Since each window closes before the next opens, the material cannot be re-read, and regressive eye movements are discouraged in ordinary reading."

"By increasing the amount of material in each window the eye span is broadened."

"The ease with which the speed of the instrument may be regulated makes it very valuable in increasing the pupil's habitual speed in reading."

"Our teachers are enthusiastic about the Ophthalm-O-Graph because it is portable and easy to operate; because it furnishes the most satisfactory method, so far found, for recording fixations, regressions and speed of reading. The record secured is the teacher's only objective test for determining how the eyes actually behave in the act of reading.

"These are only a few of the many advantages which we see in the use of the Ophthalm-O-Graph and Metron-O-Scope. I am firmly convinced that the only limit to the possibilities of these instruments is the ability, originality and initiative of the teacher.

"One of the most striking things about this work is the readiness with which teachers, both old and young, take up

its use, and their enthusiasm after they have used it. One of our most enthusiastic is a first-grade teacher who has been teaching for thirty years."

Controlled Reading in the High School

Fig. 18 Reading Training with the Metron-O-Scope in a high school class

The Metron-O-Scope has been used successfully in the content field at the high school level. A. E. Lamb, teacher of civics at Smithville, Texas, carried on experimental work for two years, using special rolls which he had prepared for both teaching and testing The data show that the students in the experimental group, as a result of the training in controlled reading, made higher scores, not only in civics but in all the school subjects, than those in the control group.

Teacher Training Courses in Reading

Teacher training institutions are finding that there is great enthusiasm for this new type of work. Special courses are offered in clinical procedure in which the student-teacher not only learns to manipulate the instruments used in diagnostic, teaching and corrective procedures but improves her own reading efficiency by practice with the techniques employed.

Mrs. Hattie Price Baker, Director of Visual Education at Howard Payne College, writes about her experience with the Ophthalm-O-Graph and the Metron-O-Scope, and the results obtained in class work:

Fig. 19 College Class Reading from The Metron-O-Scope

"Two years' actual experience with the Metron-O-Scope used in connection with college and public school classes has proved to us conclusively that it may be used very successfully in teaching many subjects. Students enjoy reading on the Metron-O-Scope, and say it enables them to read much better. This has been further proved by the fact that a class in Elementary Methods and Visual Education has just made the highest grade average of any class I have had during my fifteen years of teaching experience.

"This class of sixty-eight college freshmen was in session three one-hour periods each week for eighteen weeks. At the beginning of the semester each student's eye movements were accurately photographed on the Ophthalm-O-Graph by my freshman student assistant, Gordon Lamb, and Iowa Silent Reading Tests were given Ten to fifteen minutes of reading on the Metron-O-Scope were given at each period increasing in length to about twenty minutes per period and gradually increasing the speed.

"At the close of the semester another silent reading test showed marked improvement in every case with a final class average of 93% at a speed of 400 words per minute on the Metron-O-Scope while the Ophthalm-O-Graph records showed a 31% decrease in fixations and 80% in regressions.

"While these instruments are well adapted to college students, they are of even greater aid to pupils in the public schools. We are well pleased with the results obtained."

Fig. 20. Reading Clinic at the State Normal School, Oswego, New York, supervised by Dr. E. A. Betts.

Dr. E. A. Betts,[1] Director of Teacher Education at the State Normal School, Oswego, New York, writing about the Ophthalm-O-Graph and the Metron-O-Scope, says:

"All students studying the prevention and correction of reading difficulties at our school are given instructions in the use of the Ophthalm-O-Graph and the Metron-O-Scope, as well as other types of diagnostic and remedial techniques. Both of these instruments are highly desirable equipment for a reading clinic. The worth of the Metron-O-Scope has been demonstrated with both elementary school pupils and college students. It is without equal for correcting certain types of difficulties. The Metron-O-Scope is an effective device for developing rhythmical reading and rapid perception. It should be a part of the equipment of a reading clinic."

Dr. Farwell uses the Metron-O-Scope in teaching reading at all levels of instruction. She has developed a highly specialized clinical procedure for the diagnosis and correction of reading disabilities. In her reading clinic, which is the only one of its type, the standard methods for testing and teaching are supplemented by the use of all types of modern

1. Author of *Prevention and Correction of Reading Difficulties*, Row, Peterson & Co., Evanston, Illinois, 1936.

instrumentation. The student-teachers in her classes receive instruction in clinical procedures, while taking courses that improve their own reading efficiency.

Fig. 21. Dr. Louise Farwell conducting a class in controlled reading in the elementary department of the National College of Education, Evanston, Illinois.

Shutter Adjustment of Metron-O-Scope

The Metron-O-Scope furnishes the teacher with a mechanical adaptation of the well-known flash card. The words or phrases are exposed at regular intervals, the exposure time depending on the speed of the instrument. Provision is made also for automatic repetition of any words or phrases presented.

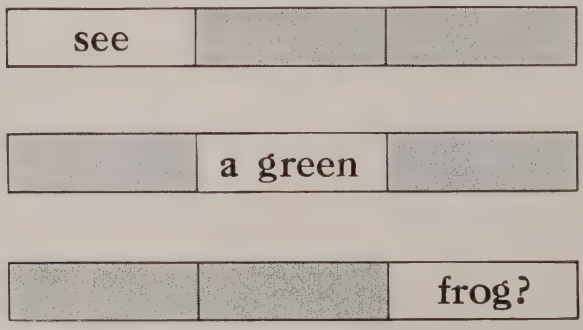
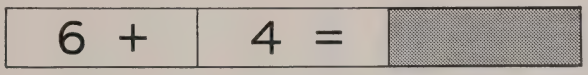


Fig. 22. Diagrammatic Illustration of the Shutter action

Any shutter may be locked open or shut, and the other windows used for short exposures in a variety of number,

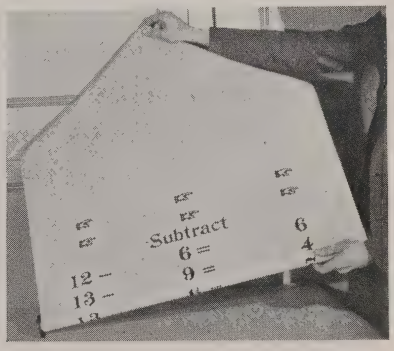
word, and phrase drills. For instance, when presenting a number roll, if the third shutter is locked shut the exposure will be



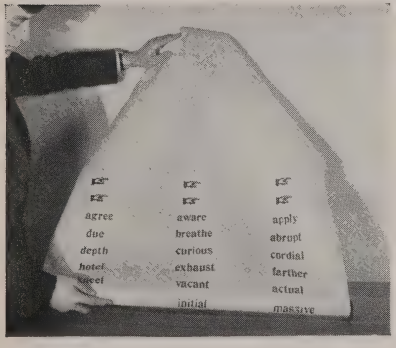
and the pupil can supply the answer.

The Metron-O-Scope might also be called an "animated" chart. The number of words exposed in a shutter varies according to the grade level of the reading material, but as far as possible the line of print is phrased in thought units. By various shutter combinations the story roll can be used effectively in word and phrase drill, and the instrument can then be adjusted instantly to present the full line.

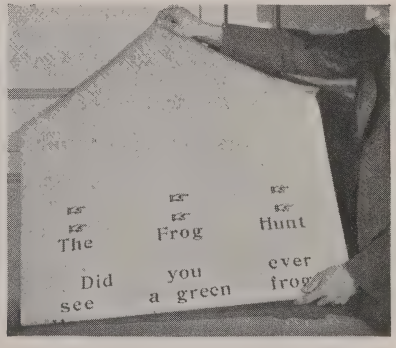
Picture roll, used in pre-reading instruction.



Arithmetic roll. The basic number operations are arranged on the roll in the order of increasing difficulty.



Vocabulary roll. Based on standard word lists.



Story roll.

Fig. 23

Reading Material

The reading material is standardized and arranged according to current educational theories. It is varied enough to take care of reading instruction at all levels, and corrective work with all types of cases.

Picture rolls start the training of very young children. These are followed by word-picture-word, color, number, vocabulary and story rolls.

Each roll is a complete reading exercise for several recitations. Difficult words are grouped for study before reading begins, and questions at the end of the roll can be used in

Fig. 24. Picture-number roll being used in the Metron-O-Scope with a primary class.

checking comprehension. The Lesson Plans which accompany the rolls facilitate the presentation of the material, and contain suggestions for correlating it with class activities in other fields. For instance, "The California Indians" provides excellent material for use in the geography and art periods, and also for dramatization.

The roll material is arranged in three sets representing three levels of difficulty which correspond, broadly, to the three levels of instruction—primary, intermediate, and high

school and advanced. A set of 24 rolls accompanies each instrument, and additional rolls may be ordered separately as needed.

Additional roll material is in preparation, including general science, civics, geography, shorthand, music, foreign languages, and other fields of study. Special sets may be assembled for the eye specialist, or the research worker interested in certain types of reading.

The introduction of the Metron-O-Scope and the roll material into the reading period does not necessitate any special adjustment of the curriculum.

VIII. THE EYE SPECIALIST IN THE READING PROGRAM.

The Ophthalm-O-Graph is used by the eye specialist in office practice to diagnose ocular anomalies. The Metron-O-Scope, in conjunction with prisms, is used in the technique known as prism-reading.[1]

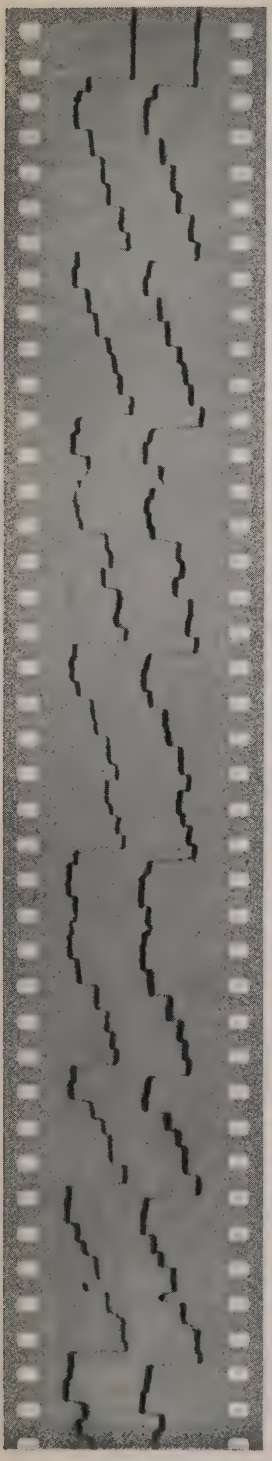
Patent Pending

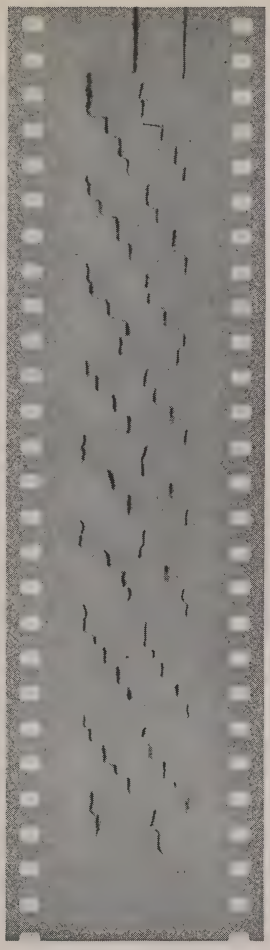
Fig. 25. Orthoptics by means of Prism-reading with the Metron-O-Scope and Phorometer. The most effective method yet developed for building fusional and accommodative reserves.

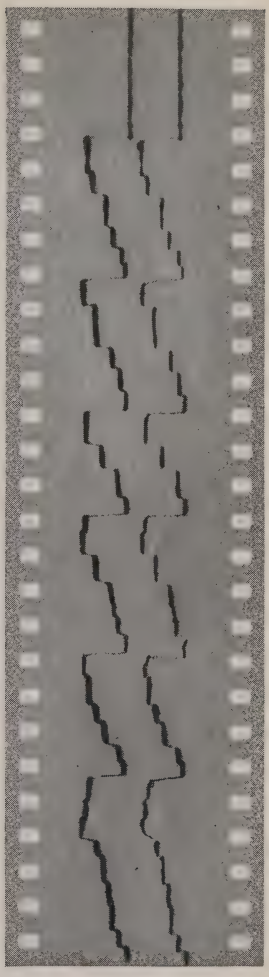
The success of a comprehensive reading program in any school depends on the active cooperation of the parents, teachers and others concerned with the welfare of the child.

The Ophthalm-O-Graph and Metron-O-Scope enable the teacher and eyesight specialist to cooperate more effectively in a program which will tend to correct the visual inefficiencies associated with reading disability.

1. Earl A. Taylor, *Controlled Reading—A Correlation of Diagnostic, Teaching, and Corrective Techniques*, chaps. XI and XII. Chicago: University of Chicago Press, 1937.







	Before Training	After Training	One Yr. Later
Fixations per 100 words . .	87	57	70
Regressions per 100 words .	20	7	8
Speed words per minute . .	305.61	481.40	355.00
Comprehension score . . .	75	100	75

Fig. 26

Comparison of reading-graphs of a high school girl aged 18 years, before training, after training and one year later.

No lenses were worn, either before or after training. Fifteen 20-minute periods of prism-reading, with emphasis on base-out exercises, resulted in comfortable vision. Comparison of the data from graphs 1 and 3 shows that the beneficial results of the training were relatively permanent.

CONCLUSION

American Optical Company presents the Ophthalm-O-Graph, a diagnostic and prognostic device. With this *portable* camera the use of eye-movement photography becomes universally available.

1. It furnishes *objective* information concerning lack of binocular coordination and lateral control of the eyes, which, in many instances, are associated directly with eye discomfort in reading. (In cases where such deficiencies are pronounced, the teacher should notify the parents through the usual channels so that they may consult their eye specialist.)

2. It is the only device which supplies objective information concerning the maturity of the reading habit, accuracy of fixation, number of fixations and regressions required in the line, reading speed, and rhythm.

3. The timed movement of the film enables the teacher to compute the reading rate, or speed, with a degree of accuracy not possible in any other type of reading test.

4. The data secured furnish the only accurate measure of the span of recognition, which determines, in large measure, the reading rate. This is obtained by dividing the number of words by the total number of fixations.

5. The reaction time can be computed from objective data. The average duration of fixation represents the average time required for (a) perception of the printed symbol, (b) comprehension of its meaning and (c) association and interpretation, before proceeding to the next fixation.

American Optical Company also presents the Metron-O-Scope, the first instrument to adequately control the reading situation. Controlled reading, as practiced with the Metron-O-Scope, is valuable both in teaching and corrective techniques.

1. It enables the reading teacher to develop simultaneously both the *mechanical and the interpretative processes of reading*.
2. It provides a highly motivated class procedure, in which interest is sustained by the fact that the presentation of the material can be varied to meet the need of the moment.

3. It creates a vivid reading situation which calls forth a coordinated physiological and psychological reaction. Reading becomes a pleasurable and meaningful experience.

4. It provides group activity, in which the reaction time is controlled.

5. It provides comparable data in the testing situation, because the situation is identical and the conditions are constant.

6. It permits the pupil to sit at ease, in an upright position, without many of the bodily adjustments which accompany reading at the near point.

7. It establishes eye habits which make for accurate binocular fixation.

8. It prevents the formation of inefficient and undesirable eye habits in the period of pre-reading and initial reading instruction.

9. In cases where poor eye habits have been established, it reconditions coordinated, rhythmical left-to-right movements.

10. No other method permits such complete control of the reading situation.

11. It conserves vision by permitting the use of the eyes in distance reading for at least part of each daily reading period.

12. It conserves teacher time in both the teaching and the testing situation.

13. The Lesson Plans provided with each roll facilitate the presentation of the material, and further conserve teacher time.

14. It permits close supervision of the classroom situation. The teacher is at liberty to observe the emotional and physical response of the individual and to correct improper posture, lip movements, and other faulty habits.

15. Prism-reading as a corrective technique, either in the office of the eye specialist, or in the reading clinic under the supervision of the eye specialist, furnishes an effective method for dealing with many cases of reading disability which are associated with visual inefficiencies.

Thus, American Optical Company offers the educator and the eyesight specialist practical instrumentation for use in the classroom and the office. The Ophthalm-O-Graph and the Metron-O-Scope fit into any situation, and are inexpensive, both in initial cost and operation.

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